

**THE STATUS OF *FORMICA LUGUBRIS* ZETT. AND
FORMICA AQUILONIA YARROW (HYM: FORMICIDAE)
IN ROSS-SHIRE AND SUTHERLAND**

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THE HOLARCTIC GENUS *Formica* contains the familiar wood ants which are a conspicuous feature of many British woodlands ranging from small fragments of deciduous woodland in the far south of Britain to the large, sprawling plantations of the Scottish Highlands. No wood ants have been recorded from Caithness, Orkney, or Shetland and it can be assumed that the colonies in Sutherland are the northern most in Britain. Of the five species found in the British Isles (*Formica rufa*, *F. lugubris*, *F. aquilonia*, *F. exsecta* and *F. pratensis*) only two, *F. aquilonia* and *F. lugubris*, are widespread in Scotland (Yarrow, 1955). It is generally thought that *F. rufa* and *F. pratensis* could not tolerate the harsher northern climate and would soon be out-competed their more hardy relatives. The endangered *Red Data Book* species *F. exsecta* has its population stronghold in the forests of Speyside and recently a few nests have been re-discovered at Rannoch and near Braemar (Hughes, 1997, Hoare *et al*, 1996, Yarrow, 1954, Collingwood, Hughes & Hoy, pers. obs., 1998).

Interest in the conservation of wood ants in Britain is a relatively recent development and is linked to the more general concern for the loss and decline of natural and semi-natural woodland and forests. The presence of wood ants within a woodland often indicates good quality habitat in that ants will only thrive in relatively undisturbed woodlands with a diverse age and vegetation structure. Changes in wood ant populations in Scotland have largely gone unnoticed due to lack of baseline data on the main populations. The situation is similar in England and Wales (see Fowles, 1994) with very little published material on the status of wood ants and only few detailed records for regional populations (e.g. Hughes, 1975 for North Wales & Barrett, 1968 for England and Wales). In order to fulfil the objectives for the conservation of wood ants in Scotland as laid out in *Biodiversity Challenge: an agenda for conservation in the UK* (Wynne *et al*, 1995) it is crucial to ascertain the extent and health of existing wood ant populations.

Fowles (1994) rightly points out that to lose wood ant colonies would be to lose an important and interesting aspect of woodland ecology. Wood ants affect the composition of woodland invertebrate communities and drive the dynamics of the woodland ecosystem in ways which are only beginning to be understood.

The purpose of this research was threefold:

- i) to summarise detailed information collected on the status of wood ants in a specified region,
- ii) to begin to develop a simple methodology for surveying wood ants at a regional level,
- iii) to help stimulate interest in wood ant conservation within voluntary and statutory conservation bodies.

Survey Methodology

Over the period 1993-1997, most of the woodlands of Ross-shire and Sutherland were visited and checked for the presence of wood ants – this includes those sites where records already existed (see particularly Collingwood, 1959). Coverage was not comprehensive but I estimate that around 70% of woodlands were surveyed and over 80% of natural/semi-natural woodlands checked. Survey concentrated on those woodlands with the greatest potential for supporting a population, particularly old birchwoods off the beaten track. Many sites were suggestions from local people, gamekeepers, landowners, etc. and, where practicable, permission to visit sites was requested. There are still many isolated sites which are yet to be visited: Loch Urigill (grid reference NC 2309), Na Leitrichean (NC 1912), and Gleann Dubh (NC 2733, 2932) are but three examples, and ants may well have been missed in some of the larger plantations.

For each site with ants, a proforma was completed giving information on site attributes. All the site information was then entered into a database to be updated as necessary.

The distribution and ecology of wood ants in northern Scotland

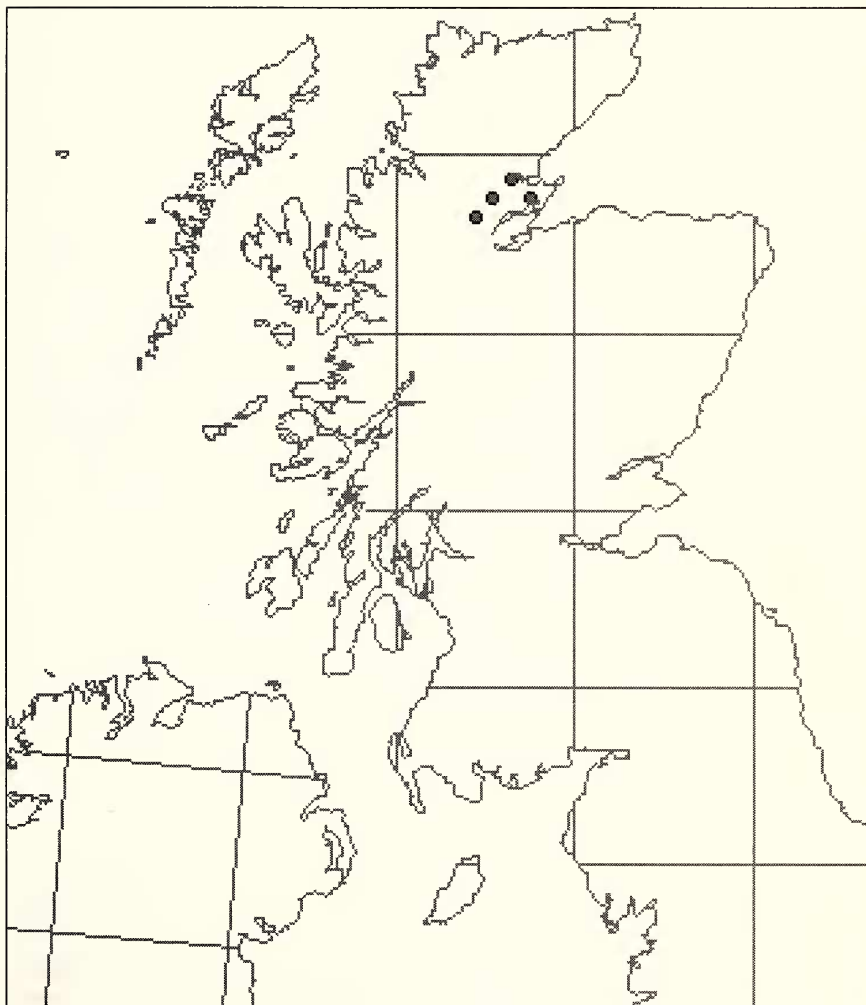
Past and Present Status

F. aquilonia is listed by the International Union for the Conservation of Nature and Natural Resources (IUCN) as vulnerable and is classified as Notable B in the UK *Red Data Books*, (Shirt, 1987) i.e. estimated to occur in 31 to 100 modern ten-kilometre grid squares. In Britain, *F. aquilonia* is restricted to the central, northern and western Scottish Highlands, north of a line approximately level with the Firth of Forth. It has only been recorded from one island, Skye (Hughes and Collingwood, pers. obs., 1988) and reaches as far north as Inverpolly National Nature Reserve in Assynt. Rather misleadingly, the cluster of nine dots in East and West Ross on the 1979 distribution atlas (Barrett, 1979) suggests a thriving population in that area. Whilst checking these records as part of this survey it was evident that many of the 10km square dots represented very small populations, barely surviving in small fragments of, usually birch, woodland. In some cases only a handful of nests were present. These colonies represent relict populations which once thrived in the formerly extensive northern Scots pine forests. The few fragments of woodland that survive are often located in inaccessible, rocky, or remote areas where exploitation of the trees for timber would have been prohibitively costly. During the course of the survey it became evident that secondary growth of birch did not support any wood ants and colonies appeared to be surviving only where there has been continuous woodland cover for many centuries.

F. lugubris is listed by the IUCN as vulnerable, but is not currently included in the UK *Red Data Books*. It occurs across many parts of the British Isles but is absent over most of southern England where it replaced by *F. rufa*. It has its strongholds in North Wales, Cumbria, Northumberland, Speyside, Braemar, and the plantations on

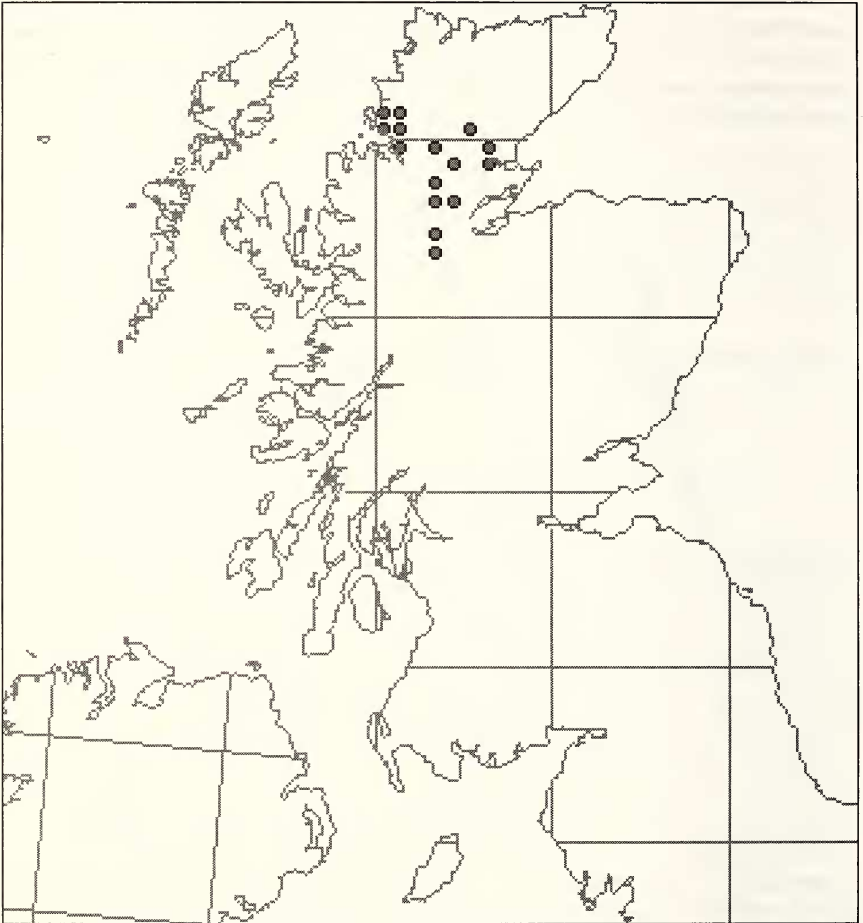
the Moray coast. North of the Great Glen it is less common and is usually found with *F. aquilonia* in or near plantation forestry (as at Longart Forest near Garve). The three 10km squares in the 1979 atlas (Barrett, 1979) are those listed in Yarrow (1955) as Corrie Valighan, Garve, and Inchbrae. This survey found *F. lugubris* to be more common than old records suggest, yet not as widespread as *F. aquilonia* in the north (Maps 1 and 2).

Formica lugubris



Map 1.

Distribution records of *Formica lugubris* Zett. during the present survey.

Formica aquilonia**Map 2.**

Distribution records of *Formica aquilonia* Yarrow during the present survey.

Wood ant habitat in Ross-shire and Sutherland

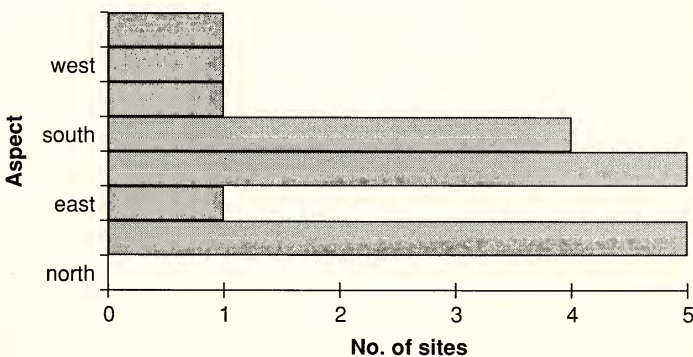
Woodlands with a range of microhabitats, i.e. those which display a variability in openness of canopy, successional age, moisture, food supply, and soil type, tend to alleviate the effects of competition (and also slave-making) and enhance the coexistence of interacting ant species (Puntilla, Haila & Tukia, 1996). In Scotland, the woodlands which support the largest populations, and greatest diversity of wood ant species are generally those large enough to hold a broad range of successional woodland types. To support the full range of wood ant species, a woodland needs to

grade from near open heath with scattered trees (*F. exsecta*), through mature open-
dense woodland (*F. lugubris*, *F. aquilonia*), containing sunny, protected glades with
uneven topography (*F. sanguinea*). These conditions are only commonly found in and
around Abernethy and Glenmore Forests, and the Rothiemurchus Estate on Speyside,
and possibly in some other remnant Caledonian pine forests such as Glen Affric.

In Ross-shire and Sutherland there are few fragments of natural/semi-natural
forest remaining and the wood ant colonies are generally small and isolated. In
northern Scotland the distribution and structure of wood ant communities appears
not to reflect microhabitat preferences as it does in Scandinavia (Puntilla, 1996.,
Putilla, Haila, & Tukia, 1996) and elsewhere in Britain (Hughes, 1975) but, quite
simply, the presence or absence of relict birch, and to a lesser extent Scots pine,
woodland. These islands of woodland are not large enough to support a number of
competing species in equilibrium and usually only contain one wood ant species.

These wood ant species, particularly *F. lugubris*, are thought to have preferences for
well drained, protected sites with a high degree of isolation, necessary for maintaining
nest temperature for brood development. South-facing aspects are thought to be
favoured as are well-drained, lower-lying sites. In the north of Scotland, one would
expect ants to maximise potential sunshine levels by colonising south facing slopes,
but this is not always the case (see Fig. 1). Of the 18 sites studied only 10 were south,
south-east and south-west facing. However, eleven had a predominantly easterly
aspect, suggesting solararia may require morning sunshine to raise nest temperatures
towards the +20°C required for normal colony functioning (Brian, 1977). The four
sites for *F. lugubris* were all south or easterly facing. Until more information can be
collected, the data set remains too small to merit statistical analysis.

Figure 1. Aspect of Scottish nests of *Formica lugubris* and *F. aquilonia*.



Wood ants occur at a wide range of altitudes from near sea-level at Loch Osaig to
300m at Gleann Mor in the Amat complex (see Table 1). This again, almost certainly
reflects the rarity of old woodland rather than any habitat preference by the ants. If
this part of Scotland was covered in continuous forest we might expect larger, more
thriving populations in the low-lying areas.

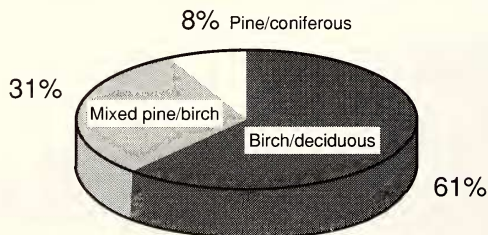
Table 1. Altitude of Scottish wood ant nests

Site name	Altitude (metres)	Site name	Altitude (metres)
Amat	150	Kildermorie	250
Calrossie	40	Ledmore	130
Cul Mor	145	Loch Oscaig	15
Drumrunie	175	Longart	150
Garbat	200	Migdale	60
Glean Mor	300	Rhegreanoch	30
Glen Einig	150	Rhiddoroch	100
Glen Stathfarrar	150	Sallachy	100
Inveran	70	Strath Vaitch	270
average 138		standard deviation 81.2	
median 147.5			

Figure 2 shows, very broadly, the types of woodland which support wood ant populations in the north of Scotland (individual woodland descriptions are given more fully in the proforma for each site, but not given here due to space limitations). Interestingly, 61% of the woodlands containing ants are almost purely deciduous (*Betula pubescens* dominated) with only 8% coniferous. This no doubt reflects the almost complete destruction of native Caledonian pine forest in this area rather than any preference for birch by the ants. Indeed, where a few ancient Scots pine have survived with birch (e.g. at Gleann Mor & Glen Einig), the wood ants tend to build larger, more productive mounds.

Figure 2.

Percentage of different types of woodland supporting nests of wood ants in northern Scotland.



The presence of wood ants in these "islands" of woodland suggests that at least *F. aquilonia* has extreme long term site fidelity, as many of the fragments have been isolated for decades, or possibly centuries. Colonies may well have shifted around within these woodlands but successive re-colonisations would have been near impossible given the degree of isolation of many of the woodlands. There are exceptions, as at Longart Forest where ants have survived within "corridors" of birch woodland along stream banks and then spread into nearby conifer plantations. The presence of aphids (particularly *Symdobius oblongus*) in these birch fragments appears to be one of the key factors determining the survival and health of colonies. The mutualistic relationship they have with the ants (honeydew provision/protection)

provides the colony with well over half its energy requirements. *Symdobius oblongus* with ants in attendance was recorded at many sites and it was noted that in those birch woodlands without *S. oblongus*, wood ants were also absent. More research is needed to assess the importance of this relationship.

Discussion and outlook

Assuming that the wood ant communities in many of these isolated birch woodlands have been a natural component of the woodland ecosystem for many centuries, the woodland invertebrate (and possibly vertebrate) communities would have been subject to profound influences from the ants. If the presence of these wood ants is an indicator of truly ancient woodland invertebrate communities, it follows that the whole ecology of these woodlands is of considerable conservation importance. Most of West Ross and Sutherland is now treeless, making the surviving fragments very important, particularly sites unique in character like the birch-hazel woodlands of northern Inverpolly. The nature conservation importance of these woodland fragments is recognised by statutory and non-statutory conservation bodies, the presence of wood ants provides a further testimony to their unique and ancient lineage.

Acknowledgements

I am indebted to Dr C.A. Collingwood, with whom I carried out much of the field work for this paper.

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Hazards of butterfly collecting – Fax for you, Sir – Korup, Cameroun, February 1996

We were camping at a small research station in Korup National Park in Cameroun, some twenty kilometres from the park entry. Today we had trekked an extra ten kilometres to Rengo Rock, a big round rocky outcrop that suddenly juts out of the rainforest. I had real hopes of good hilltopping here, but the descriptions had been better than reality. The tops of some surrounding trees were taller than the summit, so no hill-topping on the – otherwise wonderful – rock. Triste – but not a major issue; butterflies were everywhere. As indeed they should be, for Korup National Park (and the contiguous Oban Hills in Nigeria) has about 1,100 species of butterflies – about a third of all species in continental Africa. This really is biodiversity writ large.

A good day in Korup may well yield about 170 species of butterflies, including firm sight records. That is pretty good, though my personal record in a 24-hour period was actually 225 species in the Gambari Forest near Ibadan in Nigeria on a day where everything was perfect (August 1969) – weather wonderful, traps pulling in almost anything trappable, a fantastic grid of paths, plenty of the *Crematogaster* ants on which the Lipteninae depend, and a finely honed and toned collector. Just after noon at Rengo Rock a profusely perspiring ranger exited from the forest and ran up to me, saluting extravagantly: “Fax for you, Sir!” – and a fax was duly produced. It came out of a uniform pocket – it ought to have come from a cleft stick. In Evelyn Waugh’s novel, *Scoop*, the hero (or anti-hero if you prefer) asked his tropical outfitters for some cleft sticks: “I am sorry, Sir,” said the shop assistant brightly, “we don’t have them in stock. But we can send some sticks down to our cleaver to have them cloven”.

The fax was from the World Bank’s Washington Headquarters. I had planned to participate on behalf of the European Commission in the World Bank-led Donor Consortium for health and population – a small matter of about a billion dollars over five years, of which it was hoped the Commission would cough up some 100 million. The fax informed me the meeting was going to start a week earlier than planned.

I started counting backwards I had to get a Bangladesh visa in London, so I would need to leave Douala four days from now. I had to send the poor ranger back immediately to Headquarters to ensure that we could get porters the next morning to carry out our gear. Poor chap – more than sixty kilometres that day, without the